How to Lead a Math Circle Session

Math circles are for high school or younger students. Circle sessions concentrate on problem solving techniques applicable in many areas. Sample circle topics include: symmetry, the pigeon-hole principle, divisibility, counting, probability, invariants, graphs, induction, plane geometry, or inversion in a circle.

Here are some differences between a math circle and the usual math club:

- One school teacher usually runs all math club sessions. Leaders of math circles rotate. Circle leaders don't burn out, the kids see different approaches to math, and the leaders only need to prepare a few sessions that can be repeated at multiple circles. Circle leaders include teachers, professors, graduate or even undergraduate students, and other professional mathematicians.
- Circle sessions are focussed on a particular topic. "Here are a bunch of unrelated old AIME problems." is usually not a suitable circle topic.
- There is homework, but exciting and seductive homework.
- Math clubs often prepare the math team for multiple-choice or short-answer competitions, without going through the problems in depth. Math circles prepare students for Olympiad-style problems like those of BAMO, the Bay Area Mathematical Olympiad. Circles teach kids to be mathematicians who solve essay-style problems requiring proof.

Make sure your circle session goes as well as possible:

- Hand out a set of problems a week before your session. Not too many, but seductive. Include an easy one and a challenging one.
- Try not to lecture. Even though introducing new theory and techniques is an integral part of math circles, your sessions should be as interactive as possible. Score yourself: 1 point per minute you talk; 5 points per minute a student talks; 10 points per minute you argue with a student; 50 points per minute the students argue among themselves.
- Divide students into groups of 2-4 to solve problems. Have them present their own solutions.
- Be encouraging, even about wrong answers. Find something positive in any attempt, but don't be satisfied until there is a rigorous solution. Wrap up each problem by reviewing the key steps and techniques used.
- If the kids don't answer your question immediately, don't just tell them the answer—let them think. If they're still stuck, give hints, not solutions.

For details on Math Circles or on BAMO, see:

"Mathematical Circles (Russian Experience)", by Fomin, Genkin, and Itenberg, American Mathematical Society, 1993.

or

http://www.gunn.palo-alto.ca.us/bamo/